

WHAT IS CLAIMED IS:

1. A method of converting glycerol to 1,3-propanediol in a thermophilic organism, the method comprising:
 - 5 providing a thermophilic organism that ferments glycerol to 1,3-propanediol; and
 - culturing the thermophilic organism under conditions such that 1,3-propanediol is produced.
- 10 2. The method of Claim 1, further comprising the step of collecting 1,3-propanediol produced by the thermophilic organism.
3. The method of Claim 2, further comprising the step of polymerizing the 1,3-propanediol into a polymer.
- 15 4. The method of Claim 3, wherein the polymer is poly(1,3-propylene terephthalate) (PPT).
5. The method of Claim 1, wherein the thermophilic organism is *Caloramator*
 - 20 *viterbiensis*.
6. The method of Claim 5, wherein the thermophilic organism is derived from the organism deposited as ATCC designation PTA-584.
- 25 7. A method of producing 1,3-propanediol from glycerol, the method comprising:
 - incubating glycerol with a thermostable dehydratase enzyme, thereby converting the glycerol to 3-hydroxypropionaldehyde; and
 - adding a reducing agent capable of reducing 3-hydroxypropionaldehyde to 1,3-propanediol.
- 30 8. The method of Claim 7, wherein the reduction of the 3-hydroxypropionaldehyde to 1,3-propanediol is catalyzed by a thermostable 1,3-propanediol oxidoreductase.
9. The method of Claim 7 or 8, further comprising the step of collecting 1,3-
 - 35 propanediol.

10. The method of Claim 9, further comprising the step of polymerizing the 1,3-propanediol into a polymer.
11. The method of Claim 10, wherein the polymer is poly(1,3-propylene terephthalate) (PPT).
12. The method of Claim 8, wherein the thermostable dehydratase enzyme is derived from a thermophilic organism.
13. The method of Claim 12, wherein the thermophilic organism is *Caloramator viterbiensis*.
14. The method of Claim 12, wherein the thermophilic organism is derived from the organism deposited as ATCC designation PTA-584.
15. An isolated thermostable glycerol fermentation enzyme that is derived from *C. viterbiensis*.
16. An isolated thermostable glycerol fermentation enzyme that is derived from the organism deposited as ATCC designation PTA-584.
17. An isolated thermostable glycerol fermentation enzyme that is homologous to a thermostable glycerol fermentation enzyme derived from *C. viterbiensis*.
18. The isolated thermostable glycerol fermentation enzyme of Claim 11, 12 or 13 that is a dehydratase.
19. The enzyme of Claim 18 that is glycerol dehydratase.
20. The enzyme of Claim 15, 16 or 17 that is 1,3-propanediol oxidoreductase.
21. An isolated culture or cell of *Caloramator viterbiensis*.

22. The isolated culture or cell of Claim 21, wherein the genome of the culture or cell is at least 95% identical to the genome of the organisms deposited as ATCC designation PTA-584.

5 23. The isolated culture or cell of Claim 21, wherein the genome of the culture or cell is at least 99% identical to the genome of the organisms deposited as ATCC designation PTA-584.

10 24. The isolated culture or cell of Claim 21, wherein the 16S rDNA sequence of the culture or cell is at least 95% identical to the 16S rDNA of the organisms deposited as ATCC designation PTA-584.

15 25. The isolated culture or cell of Claim 21, wherein the 16S rDNA sequence of the culture or cell is at least 99% identical to the 16S rDNA of the organisms deposited as ATCC designation PTA-584.

26. The isolated culture or cell of Claim 21 that is a progeny of the organisms deposited as ATCC designation PTA-584.

20 27. A method of cloning a polynucleotide sequence that encodes a thermostable glycerol fermentation enzyme, the method comprising:

hybridizing a polynucleotide probe homologous to a portion of a known glycerol fermentation enzyme gene to a polynucleotide molecule from an environmental sample suspected of containing a thermophilic organism; and

25 isolating a polynucleotide sequence that binds to the polynucleotide probe.

28. The method of Claim 27, wherein a polymerase chain reaction using a second polynucleotide probe is used to amplify the polynucleotide sequence that binds to the polynucleotide probes.

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29. The method of Claim 27 or 28, wherein the thermostable glycerol fermentation enzyme is derived from a thermophilic organism identified as fermenting glycerol to 1,3-propanediol.

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30. The method of Claim 29, wherein the thermophilic organism is *Caloramator viterbiensis*.

31. The method of Claim 30, wherein the polynucleotide probe is homologous to a portion of a known dhaB gene.

32. The method of Claim 31, wherein the dhaB gene is from *Klebsiella*.

33. The method of Claim 29, wherein at least one polynucleotide probe is selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:5 and SEQ ID NO:6.

34. The method of Claim 33, wherein the polynucleotide probe and the second polynucleotide probe are SEQ ID NO:1 and SEQ ID NO:2.

35. The method of Claim 33, wherein the polynucleotide probe and the second polynucleotide probe are SEQ ID NO:5 and SEQ ID NO:6.

36. A method of cloning a polynucleotide sequence that encodes a thermostable glycerol fermentation enzyme, the method comprising:

transforming a target organism that cannot grow anaerobically on glycerol with DNA from a thermophilic organism; and

identifying those transformed target organisms that contain the polynucleotide sequence that encodes an enzyme that ferments glycerol to 1,3-propanediol by their anaerobic growth on glycerol.

37. The method of Claim 36, wherein the thermostable glycerol fermentation enzyme is derived from a thermophilic organism identified as fermenting glycerol to 1,3-propanediol.

38. The method of Claim 37, wherein the thermophilic organism is *Caloramator viterbiensis*.

39. The method of Claim 38, wherein the *Caloramator viterbiensis* is derived from the organism deposited as ATCC designation PTA-584.

40. A method of isolating a thermophilic organism that catalyzes the fermentation of glycerol to 1,3-propanediol, the method comprising:

incubating a sample containing thermophilic organisms in media containing glycerol as the primary carbon source; and

5 isolating at least one thermophilic organism that ferments glycerol into 1,3-propanediol.

41. The method of Claim 40, wherein the sample is incubated at a temperature in the range of about 40°C to about 100°C.

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42. The method of Claim 40, wherein the sample is incubated under anaerobic conditions.

43. The method of Claim 40, wherein the sample is obtained from a natural source
15 having a temperature of between about 50° to about 100°C.

44. The method of Claim 40, further comprising the step of detecting production of 1,3-propanediol by the thermophilic organism.

20 45. The method of Claim 40, further comprising the step of determining the production of acetate by the thermophilic organism.

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